

02228  
JES



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November 22, 1968

U. S. Government

Attention: Mr. Ed. D.

Subject: Control #02228

Gentlemen:

We are enclosing a copy of the specification submitted to [redacted] for the procurement of a Stereo Comparator Head. Attached to the specification is a copy of a letter recently mailed to [redacted] which amends the specification to include reticle alignment tolerances and a less critical axial resolution requirement at 200X magnification.

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The [redacted] wishes to express its appreciation for the assistance provided in this matter by the customer's technical representative.

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Very truly yours,



Asst. Manager, Engineering

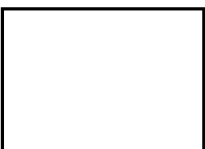
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Enclosure

NGA Review Complete

"maximum" found in Amendment #1 of 22 Nov letter  
changed to "minimum" per telecon with  
[redacted] of 25 Nov 1968 JES

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October 1, 1968

SPECIFICATION FOR [ ] HIGH POWER  
STEREO COMPARATOR HEAD

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The instrument is to be used as the optical viewing subsystem of a photographic measuring instrument. It is a major redesign of the High Power Stereoviewers manufactured on previous contracts with the U. S. Government. The primary change is in the optical system to enable the reticles to be placed in an intermediate image plane rather than in the eyepieces where they can be displaced when adjusting the interpupillary distance (IPD). Mechanical changes are required to accommodate the optical changes. In addition, the eyepiece angle will be adjustable.

The instrument consists of two [ ] Dynazoom Laboratory Microscopes coupled with an optical system to form a stereoviewer. The Dynazoom pod has a continuously variable magnification from 1X to 2X. A magnification range from 7.8X to 200X is covered with 6X and 10X [ ] Compensating Widefield eyepieces and 1.3X, 3.0X, 6X, and 10X objectives. The 3.0 and 6X objectives are not both needed to cover the magnification range, but the 3.0X objective gives a wider field and the 6X objective gives a higher resolution.

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Each optical system consists of an objective, the zoom elements, a penta prism to direct the path horizontally, an image rotation prism (Pechan), reticle, a field lens, a mirror to incline the path toward the eyepieces, a 1X relay lens, a field lens, and the eyepiece.

The following objectives are to be used with this instrument:

<u>Catalog #</u>	<u>Magnification</u>	<u>Focal Length</u>	<u>Numerical Aperture</u>
[ ] Special Order	1.3X		
[ ] Fluotar (5100)	3.0X	26.3mm	0.10
[ ] Fluotar (5105)	6X	21.0mm	0.20
[ ] Fluotar (5050)	10X	15.0mm	0.45

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The objective lenses are mounted in a four-position centerable nose-piece. The [ ] 1.3X, 6X, and 10X objectives are parfocal and require very little refocusing when changing objectives.

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The 1.3X [ ] objective is a special, wide field lens designed primarily to help locate the object to be measured. These lenses have to be accommodated in the final system, but are not a part of this order.

The zoom is adjusted by means of a knob on the top of each pod. It is graduated from 1X to 2X in tenths. The ability to provide monocular

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High Power Stereo Comparator Head, contd.

viewing or photomicrography is not included.

The Pechan prism rotates the image continuously without limit. A 180° rotation of the prism rotates the image 360°. The prism mount has a knurled knob for turning and numbers to indicate approximately the amount of image rotation. An image of a point in the object plane centered in the field of view will not move out of a 2.0mm diameter circle centered in the eyepiece focal plane when the image is rotated through 360°.

The reticle to be provided will consist of an engraved and filled black dot,  $0.020 \pm .004$ mm, in the center of the field of view and two lines each  $0.020 \pm .004$ mm by  $0.500 \pm 0.020$ mm pointing to the dot and 180° apart. When mounted in the optical path, it is absolutely essential that the dot from each reticle be superimposed one over the other so only one dot appears to the viewer. The lines of the reticle in one of the optical paths as viewed through the eyepiece shall be rotated 45 degrees to the left of vertical and the lines of the reticle in the other path shall be rotated 45 degrees to the right of vertical. The dots shall remain superimposed for all combinations of settings of the two image rotation prisms in conjunction with all the combinations of the two objective lens sets. The reticles shall be permanently mounted in the optical paths and shall not be capable of operator movement. Superimposition of the dots will be maintained regardless of the Interpupillary Distance Setting. Information pertaining to reticle dimensions and orientations of the reticle in the optical paths may be found in Fig. 1 of this specification.

The IPD of the eyepieces shall be adjustable by means of a lever through a range of 55 to 72mm. The eyepieces shall normally be 30° to the horizontal and adjustable through  $\pm 7\frac{1}{2}^\circ$  for operator convenience.

Adjustment of the eyepiece angle causes image rotation. A graduated scale reads the eyepiece angle which automatically compensates for the image rotation due to changing the eyepiece angle.

The centers of the objectives shall be 12.102 inches apart.

The following eyepieces are to be used:

<u>Catalog #</u>	<u>Magnification</u>
<span style="border: 1px solid black; display: inline-block; width: 40px; height: 1.2em; vertical-align: middle;"></span> Compensating (5551)	6X
<span style="border: 1px solid black; display: inline-block; width: 40px; height: 1.2em; vertical-align: middle;"></span> Compensating (5583)	10X

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 High Power Sterco Comparator Head, contd.

Resolution, field of view, etc. depend on the combination of eyepiece and objectives used and the position of the zoom system. The following table gives the field sizes for combinations of the above-listed eyepieces and objectives when the zoom is at 1X. When the zoom is at a position other than 1X, the total magnification is multiplied by the zoom magnification and the field is divided by the zoom magnification.

<u>Eyepiece</u>	<u>Objective</u>	<u>Magnification</u>	<u>Field</u>
6	1.3	7.8	14.0 mm
6	3.0	18	6.0 mm
10	1.3	13	14.0 mm
6	6	36	3.0 mm
10	3.0	30	6.0 mm
6	10	60	1.8 mm
10	6	60	3.0 mm
10	10	100	1.8 mm

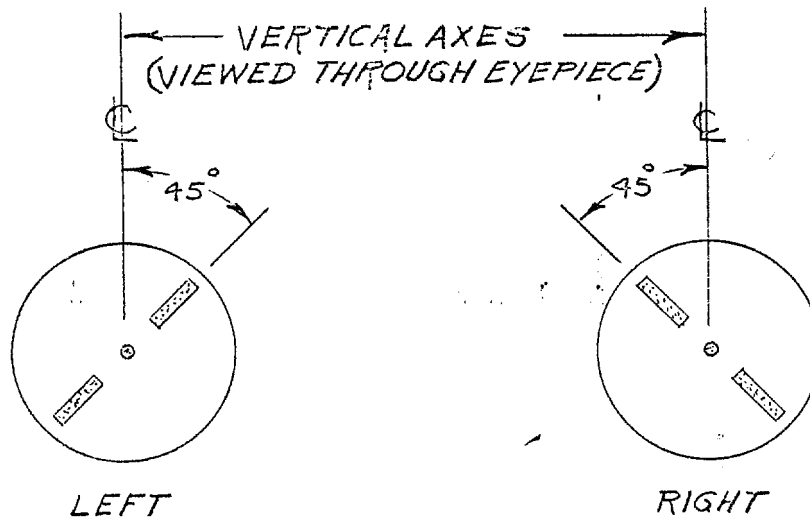
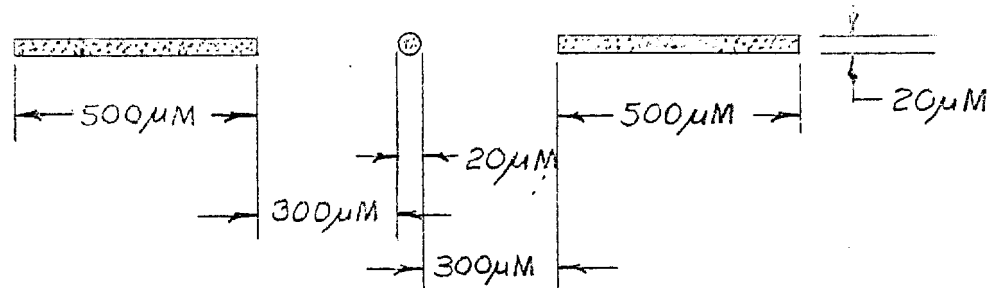
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With the 10X  eyepieces, the zoom at 2X, and the 10X  Fluotar objectives, the instrument will have a maximum axial resolution of approximately 1200 lines per millimeter. Under the same conditions, with the 6X  Fluotars, approximately 630 lines per millimeter and with the 3X  Fluotar approximately 320 lines per millimeter.

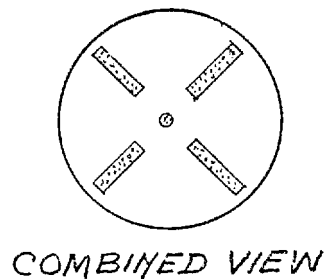
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# INDIVIDUAL RETICLE CONFIGURATION



← X COORDINATE STAGE MOTION →



November 22, 1968

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Subject: Amendments to Specification for [redacted] High Power Stereo Comparator Head dated October 1, 1968.

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Please furnish the [redacted] with a written price and delivery quotation for one [redacted] High Power Stereo Comparator Head to be manufactured in accordance with our specification dated October 1, 1968, but subject to the following amendments.

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Amendment #1

The final paragraph of the specification will be amended to read:

"With the 10X [redacted] eyepieces, the zoom at 2X, and the 10X [redacted] Fluotar objectives, the instrument will have a maximum axial resolution of approximately 1000 lines per millimeter. Under the same conditions, with the 6X [redacted] Fluotars, approximately 630 lines per millimeter and with the 3X [redacted] Fluotar, approximately 320 lines per millimeter."

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Amendment #2

The following paragraph is to be added to the specification:

To assure that the superimposition of the engraved reticle dots will be maintained regardless of the Interpupillary Distance Setting, the alignment between the two reticles will not exceed the following values.

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November 22, 1968

# RETICLE PATTERN ALIGNMENT REQUIREMENTS

Direction	Visual Angle Tolerance	Reticle Dimensions
Vertical	17 min <sup>1</sup>	.127mm
Horizontal (convergent)	1 deg 44 min <sup>1</sup>	.762mm
Horizontal (divergent)	34 min <sup>1</sup>	.254mm
Rotational	n. a.	3 degrees of arc <sup>2</sup>

Assumes: far point accommodation  
10X eyepiece

$$\text{Reticle dimensions} = \tan(\text{visual angle}) \times \frac{250 \text{ mm}}{10}$$

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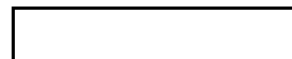
1 Ref: 1968

2 Estimate, no data available

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The would appreciate an early reply to its request for a written price and delivery quotation.

Very truly yours,



Asst. Manager, Engineering

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